1. INTRODUCTION

This Post-Demolition Risk Assessment evaluates the health protectiveness of post-demolition site conditions at Parcel B of the Boeing C-6 facility in Los Angeles, California. Specifically, does Parcel B adequately protect the health of future users? Also, what are the health impacts, if any, associated with redevelopment of the parcel as a commercial/industrial facility?

The 170-acre C-6 facility (Figure 1-1) has been used since the 1940s for industrial purposes but is currently undergoing a phased demolition and redevelopment. During each phase of the project, a post-demolition risk assessment will be conducted for the parcel undergoing redevelopment. Parcel B is shown in Figure 1-2.

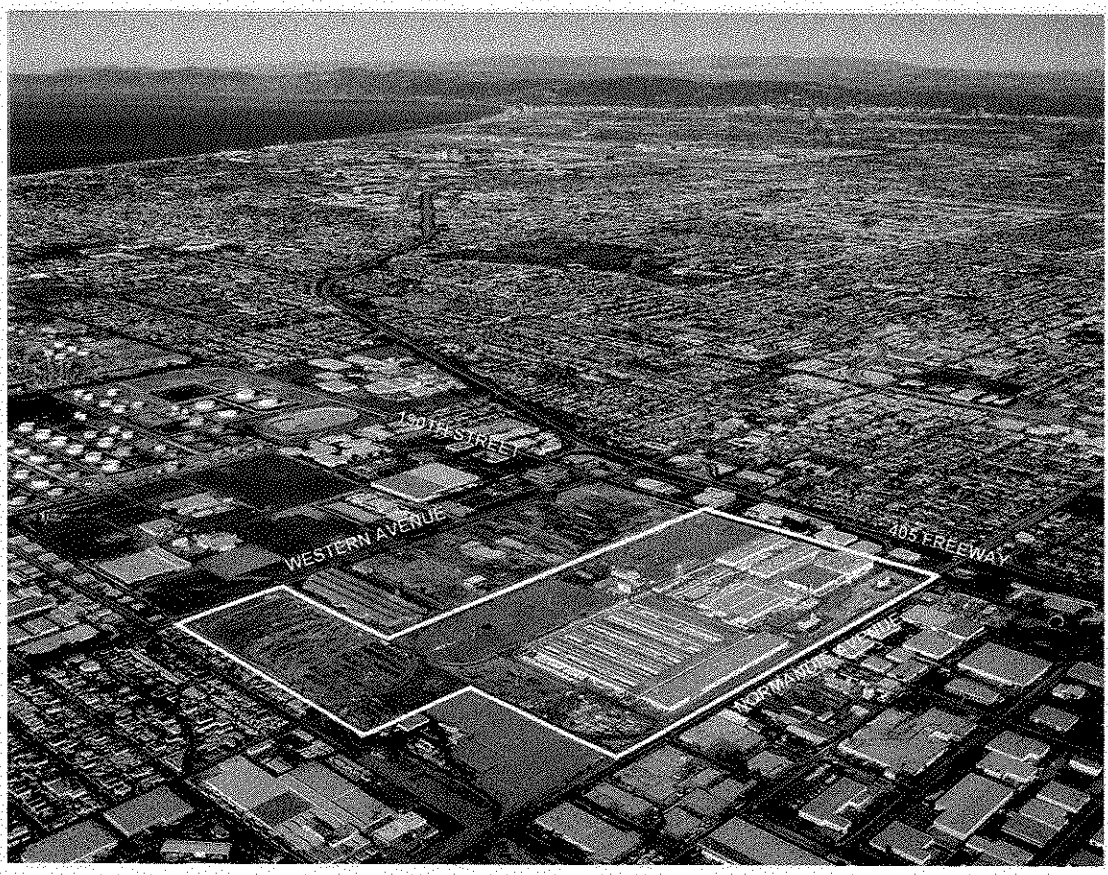
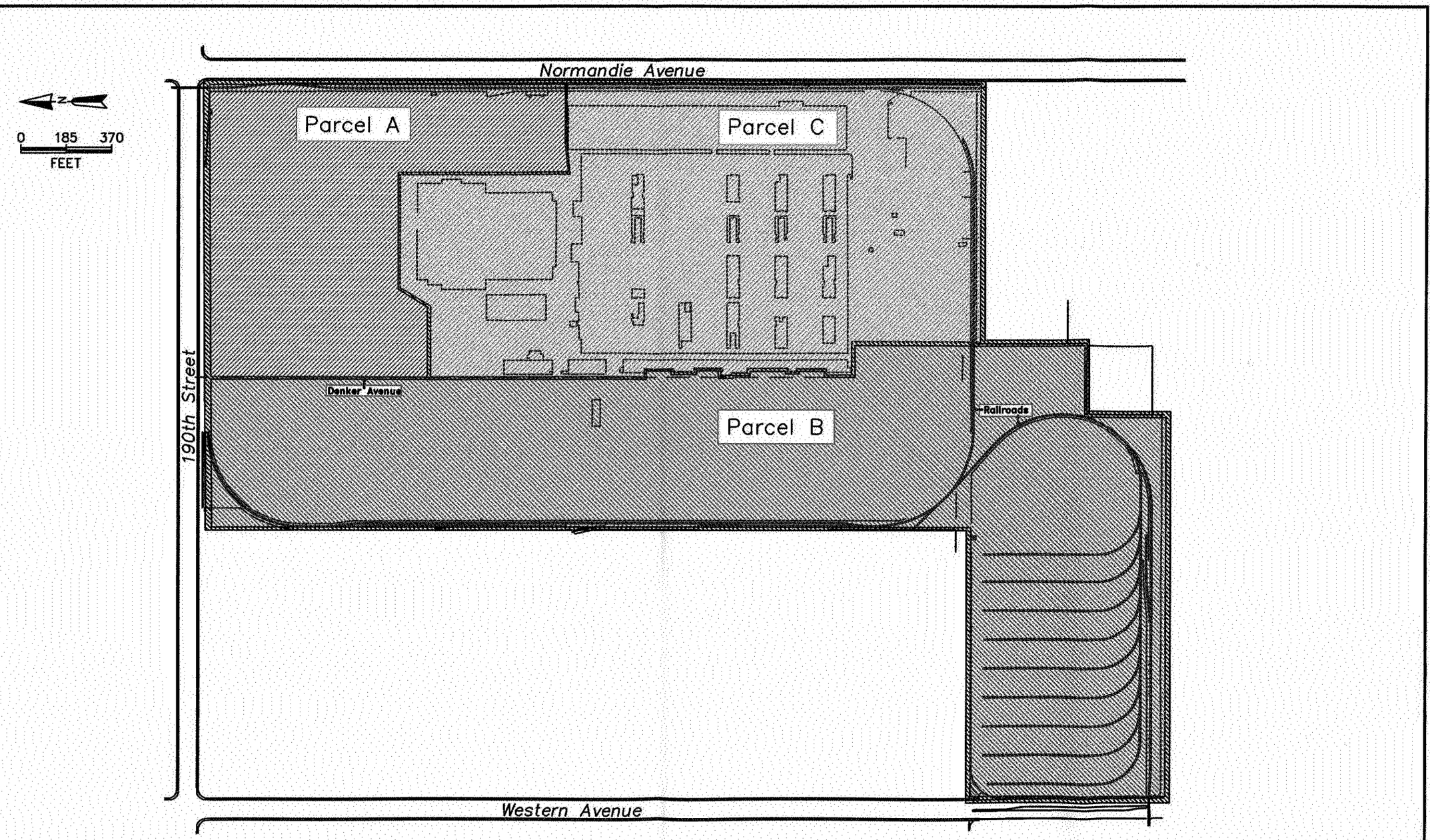


FIGURE 1-1
BOEING C-6 FACILITY (PRE-DEMOLITION) AND VICINITY, LOS ANGELES, CA



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TITLE:
C-6 Site Layout, Parcels A, B, and C
Boeing C-6 Facility
Los Angeles, CA

DWN: JDL	DES.: JDL	PROJECT NO.: ParB PDRA	
CHKD: JPO	APPD: CBS	FIGURE NO.: 1-2	
DATE: 12-02-98	REV.: 1		

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This risk assessment was prepared following the procedures and methodologies described in relevant guidance documents from the California Environmental Protection Agency (Cal/EPA) and U.S. Environmental Protection Agency (EPA). The objective, scope, and key assumptions presented have been discussed with and agreed to by the lead regulatory agency for the C-6 site, the California Regional Water Quality Control Board - Los Angeles Region (RWQCB-LA), and the lead agency for health risk, the Cal/EPA Department of Toxic Substances Control (DTSC).

1.1 OBJECTIVE AND SCOPE

The primary objective of this risk assessment is to evaluate the potential health risks to future users of the redeveloped parcel and to identify any localized "hot spots" requiring remediation (Cal/EPA 1997). As mentioned, exposures and associated risks are estimated assuming the construction and daily use of the parcel as a light commercial/industrial facility. This scenario and associated site conditions were developed in accordance with Boeing's proposed deed restrictions for the site.

By agreement with RWQCB and DTSC, this risk assessment focuses on the potential health impacts posed by Parcel B soils. Based on the extensive amount of site data collected in the past 10 years, and the proposed deed restrictions, groundwater is unlikely to present significant exposures to current or future users and is not considered a health issue. Groundwater will be addressed separately, under RWQCB guidance.

As health-protective, upper-bound estimates of risk, the findings of this risk assessment will enable the site owner and regulatory agencies to assess the magnitude of potential risks associated with Parcel B and to formulate a health-protective and cost-efficient exit strategy. As such, the findings are a vital risk-management tool for the agencies as well as current and future stakeholders.

1.2 SITE DESCRIPTION AND OPERATIONAL HISTORY

The C-6 facility (Figure 1-1) is located at 19503 South Normandie Avenue in Los Angeles, California, and is bordered by 190th Street to the north, Normandie Avenue to the east, 203rd Street to the south, and Western Avenue to the west. As shown in Figure 1-2, Parcel B fronts both 190th Street and Western Avenue.

Aerial photographs indicate that the area was farmland prior to the 1940s. Industrial use of the property began in 1941 when the Defense Plant Corporation (PLANCOR) developed the site as part of an aluminum reduction plant. The Aluminum Company of America (ALCOA) operated the plant for the government to produce aluminum during World War II. Five "pot lines" were originally constructed at the plant, but only three were placed in operation. ALCOA operated the plant until it was closed in September 1944 (CDM 1991a).

The War Assets Administration then used the site for temporary storage during the following two years. In 1948, Columbia Steel Company purchased the property. No significant changes were made to the plant under Columbia Steel Company ownership (CDM 1991a).

In March 1952, the US Navy purchased the property and established the Douglas Aircraft Company (DAC) as the contractor and operator of the facility for the manufacture of aircraft parts. DAC purchased the property from the Navy in 1970 and used the facility to manufacture components for various commercial and military aircraft until approximately 1992. Since cessation of manufacturing activities, DAC has used the C-6 facility to store and distribute aircraft parts (K/J 1996a, 1996b, 1996c).

Boeing Realty Corporation became the site operator responsible for cleanup in August 1997, when its corporate parent, the Boeing Company, acquired McDonnell Douglas. Boeing is working with multiple agencies on C-6 closure and redevelopment. In addition to RWQCB-LA and DTSC, the South Coast Air Quality Management District (SCAQMD) and the City of Los Angeles are involved.

Table 1-1 summarizes the land-use history of the C-6 property.

TABLE 1-1
LAND-USE HISTORY

Period	Land Use	Operator/Owner
Before 1941	Farmland	
1941-44	Aluminum reduction complex	ALCOA for Defense Plant Corp.
1944-48	Warehousing	War Assets Administration
1948-52	Warehousing	Columbia Steel Company
1952-70	Manufacture of aircraft parts	Douglas Aircraft Co. for U.S. Navy
1970-92	Manufacture/assembly of aircraft components	Douglas Aircraft Co.
1992-Pres.	Storage/distribution of aircraft spares, Storage of production line material and tooling	Douglas Aircraft Co. for McDonnell Douglas (now Boeing)
1996-Pres.	Site investigation, demolition and redevelopment	Boeing Realty Corp. (formerly McDonnell Douglas Realty Co.)

SOURCE: Boeing

1.3 SITE CHARACTERIZATION STUDIES

Since the mid-1980s, the C-6 facility has undergone several site assessments and characterization studies (e.g., CDM 1991a,b; K/J 1996a,b,c,d, K/J 1997, K/J 1998; IESI 1998e). To date, the most thorough investigations of Parcel B have been the Phase II soil characterization studies (K/J 1997 and 1998) conducted by Kennedy/Jenks Consultants. These and other important investigations of the C-6 site are summarized below. Note that only information pertaining to Parcel B soils is discussed.

1.3.1 Limited Phase I and Phase II Studies—Camp Dresser & McKee

In 1991, Camp Dresser & McKee (CDM) performed a Phase I environmental assessment in two portions of what is now Parcel B (CDM 1991a). Based on a review of available reports and historical aerial photographs, CDM concluded that the site had not been used for the generation

or storage of hazardous wastes or substances. Based on information obtained regarding elevated levels of DDT and organic constituents in the groundwater originating from adjacent sites, a Phase II subsurface soil investigation was recommended.

Six soil borings were advanced for the collection of subsurface soil samples. Samples were analyzed for halogenated hydrocarbons (EPA methods 8020 and 8010), polychlorinated biphenyls (PCBs) and pesticides (EPA 8080), and metals. CDM believed no further investigation was warranted based on the findings of this limited investigation (CDM 1991b).

1.3.2 Comprehensive Phase II Study—Kennedy/Jenks Consultants

In 1997, Kennedy/Jenks conducted a comprehensive Phase II soil characterization of Parcel B (K/J 1997, 1998) under RWQCB supervision. During the study, 108 soil borings were drilled and 550 soil samples collected and analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and total recoverable petroleum hydrocarbon (TRPH). Selected additional analyses, including Title 22 metals, PCBs, pesticides, and cyanide, were performed on an area-by-area basis. None of the areas investigated were found to contain constituents at levels that warranted the designation "area of concern" (K/J 1998).

1.3.3 Supplemental Site Investigation—Integrated Environmental Services

After Kennedy/Jenks released its Phase II soil characterization report, numerous aerial photographs and site drawings were discovered during the ongoing review of C-6 historical records. A review of the photographs, which date from the 1950s, and engineering drawings, which date from the 1940s, identified three areas containing structures of environmental interest near the central portion of Parcel B. Analytical results from the Parcel B Supplemental Site Investigation were supplied to RWQCB and DTSC for review in July 1998 (IESI 1998e). These data are further evaluated later in this section.

1.4 CURRENT CONDITIONS

McDonnell Douglas (now Boeing) began a phased redevelopment of the 170-acre C-6 property in 1996. Redevelopment of the western-most portion of the property, Parcel B, began in 1998 and is nearly complete. Parcels of the property impacted by each phase of the redevelopment will undergo environmental assessment, characterization, excavation and, if needed, remediation.

Parcel B demolition is almost complete. Thirteen of fourteen buildings (37,000 square feet) have been razed, and the parcel has been graded for redevelopment. After the remaining building has been demolished and soil samples collected from its location (scheduled for January 1999), an addendum to this risk assessment will be prepared.

Before title transfer, clean, imported soil will be placed over the entire parcel. This material is required to meet the specified grading conditions for the future site owner. However, the maintenance of this material will not be specified in the proposed deed restrictions. Therefore, this risk assessment estimates potential health effects both with and without the fill material.

1.5 SURROUNDING LAND USE

The surrounding area is characterized by a mixture of industrial, commercial, and residential land uses. Two National Priority List (NPL) federal Superfund sites and one California Superfund site border the C-6 property, while three other known hazardous-waste-impacted sites are within a half mile (see Figure 1-3).

The C-6 property is currently zoned for heavy industrial (M3-1) use, while the area north of the facility is zoned for light industrial (M2-1) use. The area to the south of the facility is zoned for commercial manufacturing; however, some single-family homes and apartments are located there (CDM 1991a). Several of the properties adjacent to C-6 have undergone extensive environmental investigation and are known to have contributed to the regional contamination of groundwater in the area. The more environmentally significant properties include the Montrose Chemical, Del Amo, and Lockheed Martin Corporation International Light Metals (ILM) sites.

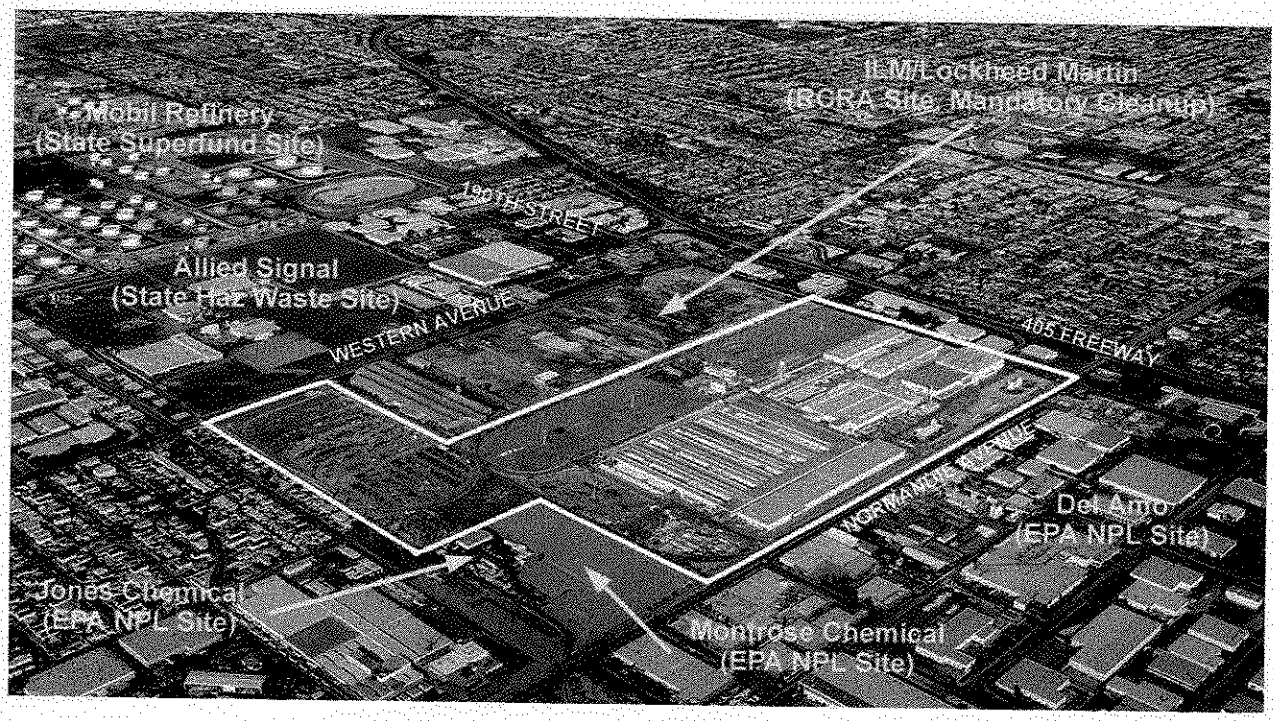

FIGURE 1-3
NEIGHBORING HAZARDOUS-WASTE-IMPACTED SITES

The Montrose Chemical property, adjacent to the south side of the C-6 facility, is an NPL Superfund site. The site was used between 1947 and 1982 for the production of the pesticide DDT. The Montrose facility was dismantled in 1985 (CDM 1991a). An environmental cap now covers the entire site. Potential future uses of the property are unknown.

The Del Amo NPL Superfund site is 1500 feet east of C-6, across Normandie Avenue. Between 1942 and 1969 the site was used to manufacture synthetic rubber (K/J 1994d). Aqueous sludges produced during manufacturing operations were disposed on site in three large, shallow evaporation ponds and six sumps. The ponds contained high levels of polynuclear aromatic hydrocarbons (PAHs) and lower levels of VOCs (CDM 1991a). The Del Amo site is currently under EPA jurisdiction, and remedial investigations are underway (K/J 1996a, 1996b, 1996c).

The Lockheed Martin ILM site, adjacent to the west side of C-6, was used from 1946 to 1992 for metals production. Chlorinated and petroleum-based solvents, waste oils, and PCBs are among the wastes produced (K/J 1994). All structures have been razed, and the top 10 feet of soil have been remediated under DTSC supervision. Redevelopment is underway.

1.6 RISK ASSESSMENT METHODOLOGY

As discussed, this post-demolition risk assessment evaluates the potential health impacts to human receptors associated with post-demolition site conditions at Parcel B and the proposed development of the parcel as a commercial/industrial facility. As shown in Figure 1-4, the risk-estimation methodology consists of six distinct steps, some of which may be performed concurrently.

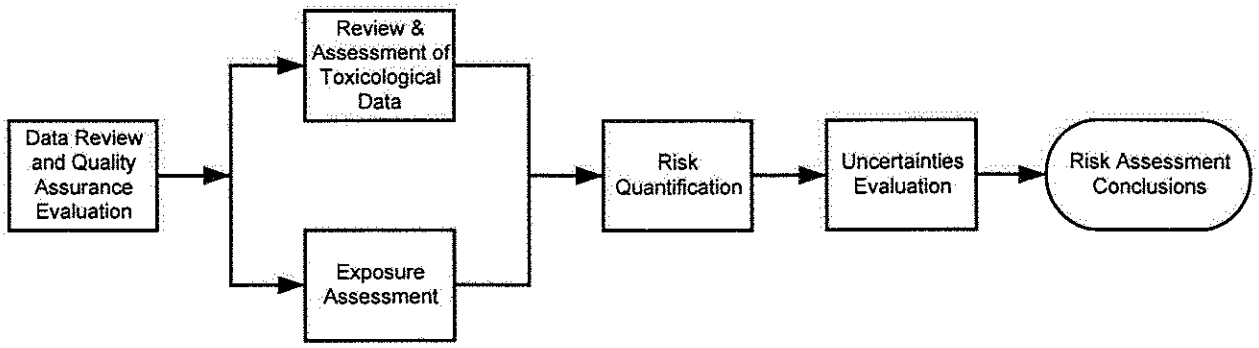

FIGURE 1-4
POST-DEMOLITION RISK ASSESSMENT PROCESS

First, the post-demolition data associated with Parcel B were reviewed and the analytical results compiled. The data were screened according to data usability criteria established for risk assessment. Of the data meeting these quality criteria, constituents of potential concern (COPCs) were selected based on frequency of detection, mobility, and persistence.

Second, those COPCs for which EPA toxicity data exist—as published in the California Cancer Potency Factors Update, Integrated Risk Information System (IRIS), Health Effects Assessment Summary Tables (HEAST), or surrogate values provided by DTSC—were selected for risk analysis. For COPCs without such toxicity data, health-based evaluations could not be completed.

In Step 3, comprehensive post-demolition exposure scenarios were developed that describe the potential exposures at Parcel B and provide a basis for quantifying those exposures. Each exposure scenario was developed to address the source of residual COPCs, route or mechanism of exposure, and potentially exposed populations (known as "receptors"). When site-specific data for scenario development were unavailable, conservative values found in the literature were used.

In Step 4, the toxicity and exposure assessments were summarized and integrated into quantitative expressions of risk. Specially designed spreadsheets were developed to calculate COPC-specific, multipathway risks for each of the Parcel B receptors.

Usually, the risk values presented in a risk assessment are not fully probabilistic estimates of risk but conditional estimates given a considerable number of assumptions about exposure and toxicity. Thus, it is important to fully specify the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in proper perspective. This process is conducted in Step 5.

Step 6 involves the development and presentation of conclusions that can be inferred from the findings of the risk assessment. This step is useful in providing risk managers insight into the interpretation of the risk assessment results.

1.7 GUIDANCE DOCUMENTS

The following major guidance documents and/or information sources were used in the preparation of this risk assessment:

- Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities (Cal/EPA 1992)
- Risk Assessment Guidance for Superfund (RAGS): Volume I - Human Health Evaluation Manual, Part A (EPA 1989a)
- Risk Assessment Guidance for Superfund (RAGS): Volume I - Human Health Evaluation Manual, Part C, Risk Evaluation of Remedial Alternatives (EPA 1991a)

- Guidance for Data Usability in Risk Assessment (EPA 1992c)
- Exposure Factors Handbook (EPA 1990a)
- Dermal Exposure Assessment: Principals and Applications (EPA 1992a)
- California Cancer Potency Factors (Cal/EPA 1996)
- Integrated Risk Information System (IRIS) database (EPA 1998)
- Health Effects Assessment Summary Tables, Annual FY-1997 (EPA 1997)
- Superfund Exposure Assessment Manual (EPA 1988c)

1.8 REPORT ORGANIZATION

The COPCs for Parcel B are identified in Section 2. This section discusses data sources used in the post-demolition risk assessment within the context of a hierarchy developed on the basis of the data quality criteria. Section 2 also presents the methodology used to determine the preliminary and final lists of COPCs.

Section 3 summarizes toxicity information (both carcinogenic and noncarcinogenic effects) for each Parcel B COPC. This section also identifies the toxicity criteria used to characterize potential health risks.

The conceptual exposure model is addressed in Section 4. This section characterizes the physical and chemical setting of the C-6 site, with an emphasis on Parcel B COPC sources, land use, current geological and hydrological conditions, and potentially exposed populations. Through the Parcel B conceptual exposure model, possible exposure pathways are identified, and those pathways deemed significant to the identified receptors are selected for quantitative evaluation.

Exposure point concentrations are calculated in Section 5. The statistical evaluation of soils data and air transport analysis is presented.

Potential health risks to the exposed receptors are characterized in Section 6, Risk Characterization. This section presents the risk characterization methodology and health risk estimates for the Parcel B land use and associated exposure scenarios developed in Section 4.

Uncertainties associated with the predicted risk values are discussed in Section 7. The potential magnitude and direction of bias that may be introduced by each uncertainty factor to the predicted risk values are evaluated. The discussion includes identification of uncertainties related to COPC selection, exposure assessment, toxicity determination, and risk characterization.

Section 8 presents a summary of findings and the conclusions/recommendations of this report as to the health protectiveness of the post-demolition Parcel B and its proposed commercial/industrial land use.

The references used in the development of this report are presented in Section 9.

To assist the reader in understanding how the risk values were derived, risk calculation sheets and additional necessary information are presented in appendices.

Appendix A contains computer printouts from the ISCST3 air dispersion model of the COPCs.

Appendix B is a complete set of COPC intake and risk calculation sheets arranged by receptor. Both carcinogenic and noncarcinogenic risk calculations are presented for each receptor via each significant exposure pathway.

Appendix C contains the complete set of data used in the post-demolition risk assessment. Statistical summaries are also provided.

The equations used in the statistical evaluation of the post-demolition data set are presented in Appendix D.

The Peclet calculation used to identify vapor transport mechanisms at the site is presented in Appendix E.